DOCUMENT RESUME

ED 388 784 CE 070 168

AUTHOR Lewandowski, Carol
TITLE Charts and Graphs in the Workplace. P.R.I.D.E. People Retraining for Industry Excellence.
INSTITUTION Mercer County Community Coll., Trenton, N.J.
SPONS AGENCY Office of Vocational and Adult Education (ED), Washington, DC. National Workplace Literacy Program.
PUB DATE 95
CONTRACT VA198A30142-93
NOTE 59p.; For related documents, see ED 351 578-599, ED 368 968-988, and CE 070 164-183.
PUB TYPE Guides - Classroom Use - Teaching Guides (For Teacher) (052)

EDRS PRICE MF01/PC03 Plus Postage.
DESCRIPTORS Adult Basic Education; Adult Literacy; Behavioral Objectives; *Charts; Competency Based Education; Curriculum Guides; *Graphs; Instructional Materials; Job Skills; Labor Force Development; Learning Activities; *Literacy Education; Mathematics Skills; Student Evaluation; *Tables (Data)
IDENTIFIERS *Workplace Literacy

ABSTRACT

This workplace skills course on charts and graphs in the workplace is intended to teach students to read and make tables and graphs, make projections from charts/graphs, see trends and draw conclusions from charts/graphs and calculate totals, averages, and percentages. Introductory material includes objectives, topics, methods, and materials. The course consists of eight sessions, each of which has these components: objectives, topics, methods, materials list, and information sheets and handouts. Topics covered in the sessions include the following: tables; bar graphs; line graphs; pie charts; drawing conclusions; seeing trends; plotting information in different types of charts/graphs; and calculating totals, averages, and percentages. (YLB)

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Charts and Graphs in the Workplace

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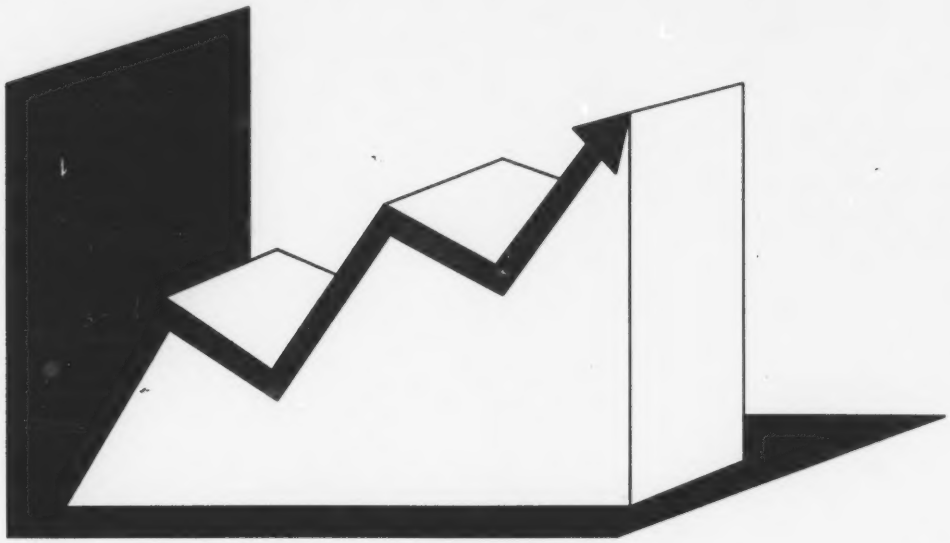
Charts and Graphs in the Workplace



Mercer County Community College
Division of Corporate and Community Programs
1200 Old Trenton Road
Trenton, NJ 08690

Elaine S. Weinberg
Director, Workplace Skills

Developed with funds from the United States Department of Education
National Workplace Literacy Program

1995

ACKNOWLEDGMENT

Mercer County Community College thanks Carol Lewandowski, Senior Education Specialist/Curriculum Developer for creating this manual. Through her valuable contributions employees in manufacturing and service industries learned concepts relevant to their existing jobs and strategies for learning other tasks if that opportunity should arise.

WORKPLACE SKILLS TRAINING PHILOSOPHY

A factory or service center creates a classroom that is very different from the one we are used to seeing in colleges and adult schools, so it only follows that our approach to teaching in the factory should also differ.

Our goal is to teach employees skills that they need in order to be functional and successful in their work environment, and encourage them to apply those skills on the job and at home. For example, we motivate students to do the following:

- work more efficiently and more safely
- make fewer mistakes
- solve problems working interactively
- take greater responsibility for their jobs
- recognize the interconnectedness of the various jobs in their workplace
- be better communicators in the workplace

Company needs are revealed through a needs assessment. At that time, we also determine the basic skills needs of the employees. We are learner centered, as the individual employee's needs are considered alongside those of the company.

Once we have determined those needs, we develop curricula that incorporate basic skills, using the workplace literature (e.g. forms, applications, codes, abbreviations, charts and tables, handbooks, regulations, procedures, policies, memos, letters) of the company. Because each company is different, the needs and literature are also different; hence, we develop new materials for every company in which we teach. By utilizing these workplace items, we help students transfer and apply their skills directly to their jobs.

We rely on the classroom techniques of problem solving, cooperative learning, and group discussion. Our overall approach is concept based, with the emphasis on application, such as in role plays, dialogues, and group work. Despite the specific course titles, we incorporate the elements of math, English, and communication skills into all of our sessions.

In terms of students evaluation, after initial testing we give a pre-test and post-test in order to determine comprehension. Students receive feedback throughout the course from the instructor, as well as from fellow students as we sincerely believe in the powerful positive reinforcement of peer critiques and cooperative exchanges.

In essence, we believe that although we make the materials for the students with which to work, it is the students who truly make the class.

CHARTS AND GRAPHS IN THE WORKPLACE

OBJECTIVES:

At the end of this session, students will be able to do the following:

- read a simple table
- read a complex table
- make a table from gathered information
- read and make bar graphs, multiple bar graphs, line graphs, multiple line graphs, pie charts
- understand the differences between the different types of charts and graphs
- take data and make an appropriate graph/chart
- make projections from charts/graphs
- see trends and draw logical conclusions from charts/graphs
- calculate totals, averages, and percentages

TOPICS:

- tables
- bar graphs
- line graphs
- pie charts
- drawing conclusions
- seeing trends
- plotting information in different types of charts/graphs
- calculating totals, averages, and percentages

METHODS:

- Class discussion
- Individual work
- Pair work on some of the graphs/charts

CHARTS AND GRAPHS IN THE WORKPLACE

MATERIALS:

- Worksheets
- Rulers
- Graph paper
- Cylinder with which to make a pie chart circle
- Calculators

CHARTS AND GRAPHS IN THE WORKPLACE ♦ SESSION 1

OBJECTIVES:

At the end of this session, students will be able to do the following:

- read a simple table
- read a complex table
- make a table from gathered information

TOPICS:

- tables

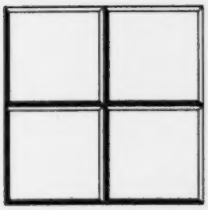
METHODS:

- Class discussion
- Individual work

MATERIALS:

- Worksheets
- Graph paper
- Calculators

TABLES



WHY do we use tables?

- Tables show information in a clear and concise way.
- Tables are especially useful for showing numerical information.
- Tables are efficient.
- Tables make it easier for the reader to compare information.

TABLES

How to read a table correctly?

1. What is the **title** of the table?

2. How many **columns** are there?

3. How many **rows** are there?

4. What are the **column headings**?

5. What are the **row headings** (if there are any)?

6. Are there shaded areas? Are there any **bolded** or *italicized* words? Why do you think this has been done?

7. Are there **abbreviations, symbols, or codes**? What do these stand for?

8. What **kinds of numbers** are being used? Whole numbers? Decimals? Percentages? Fractions? What other units?

TABLES

9. Have the numbers been shortened to **represent** hundreds, thousands, millions? This will be in the key or as a note to the table.

10. What do the numbers **stand for**? Prices? Codes? Quantities? Time periods? Rates?

11. What **kinds of information** are being compared?

12. What **conclusions** can you come to based on the information given in the table?

MENU

The most familiar type of table is a **menu.**

La Cocina de Fuego

Burgers

Hamburger	2.25
Cheeseburger	2.50
California Burger	3.00
Veggie Burger	1.75

Sandwiches

Tuna	3.00
Roast Beef	3.50
Egg Salad	2.25
American Cheese	1.75
Swiss Cheese	1.80

Drinks

Coffee / Tea		.50
Soda	S	.75
	M	.90
	L	1.25
Milk		.80

Gratuity suggested: 15% of pre-tax bill

12

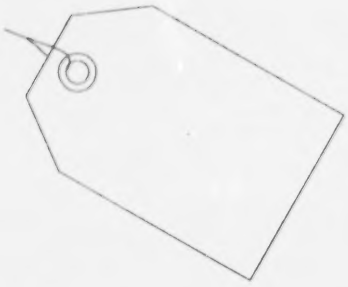
INVENTORY OF PRODUCTS

Look at the different use of numbers in this table.

Inventory of Products in 1993

	1	2	3	4
XX889	53	44	55	52
XX870	381	20	13	520
XY889	197	109	154	181
XY870	2	15	39	80
XZ898	24	64	93	109

PART AND ITEM CODES



Code	Item	Fits
XX889	3" cap	1992 model
XX870	2" cap	1993 model
XY889	3.5" cap	1993 model
XY870	2.5" cap	1992 model
XZ889	4" oval cap	1990 model

TABLES

1. What are the column headings? What do they stand for?

2. What are the row headings? What do they stand for?

3. What do the numbers in the body of the table represent?

4. What are you being asked to compare?

5. Which item was the most consistently stocked?

6. Which item had the greatest ups and downs?

7. If you were planning to make a sales projection on the item that would move the quickest from your inventory, which one would you pick? Why?

CHARTS AND GRAPHS IN THE WORKPLACE ♦ SESSION 2

OBJECTIVES:

At the end of this session, students will be able to do the following:

- read a complex table
- make a table from gathered information
- calculate totals

TOPICS:

- tables
- drawing conclusions
- seeing trends
- calculating totals, averages, and percentages

METHODS:

- Class discussion
- Individual work

MATERIALS:

- Worksheets
- Rulers
- Graph paper
- Calculators

TABLE

Here is a table taken from the company's weekly Quality Report. Look at how it is arranged and what it is comparing. (Use company's specific table for reference)

PRODUCTIVITY TABLE: QUESTIONS

1. How many sections do you see to the table? What are the headings?

2. In the first column, what do the numbers stand for?

3. In the second column, what do the numbers stand for?

4. In the third column what do the numbers stand for?

5. In the fourth column, what do the numbers stand for?

6. In the fifth column, what do the numbers stand for?

7. In the sixth column, what do the numbers stand for?

8. In the seventh column, what do the numbers stand for?

9. For the week of 11/14 – 11/21, did the company meet its goal for packed pounds per man-hour at plant 1?

PRODUCTIVITY TABLE: QUESTIONS

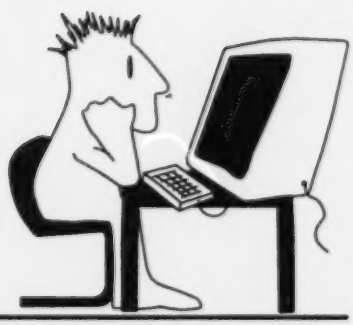
10. For the week of 11/21 – 11/28, did plant 1 meet its goal for mixed batches per man-hour?

11. For the week of 11/28 – 12/5, did plant 2 meet its goal for volume per man-hour?

12. For the week of 12/5 – 12/12, which plant met its goal on packed pounds? Which plant met its goal on volume per man-hour?

13. For the same week (12/5 – 12/12), did plant 2 meet its goal for packed pounds for man-hour?

14. Why is the row of 12-12-93 set off from the other rows and bolded?



PRODUCTIVITY TABLE: EXERCISE

Complete this productivity table using the information on the next page.
(Use company's table for exercise)

TABLES

- Productivity Information for the month of July
- To be included in the 7/31 productivity report.

7/4 – 7/10 Plant 1 packed 105 pounds per man-hour. The goal was 101.
Plant 1 mixed .88 batches per man-hour. The goal was .85.
Plant 2 had a volume of 89, which went above its goal by 5.

7/11 – 7/17 Plant 1 mixed .83 batches, and fell below its goal by .03.
Plant 1 packed 100 pounds, and exceeded its goal by 5 pounds.
Plant 2 was closed due to a fire. It did not meet its goal, which was the same as in the earlier week.

7/18 – 7/31 Plant 2 reopened and had a volume of 50, which fell 35 short of its goal.
Plant 1 packed 98 pounds, and met its goal on target.
Plant 1 mixed .73 batches, and missed its goal by .01.

JANUARY PRODUCTION TABLE

(All numbers are in thousands)

	Jan
1988	1.1
1990	2.2
1992	1.9

1. What information is this table comparing?

2. Which was the best January production to date?

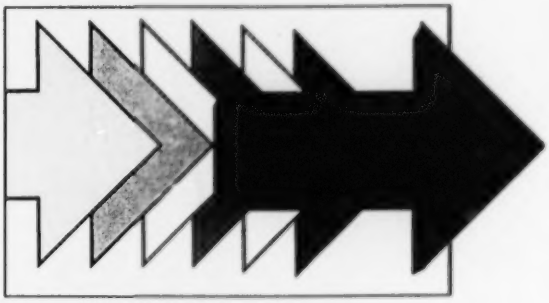
3. Which was the worst January production to date?

4. What was the difference in production between January 1988 and January 1992?

5. What was the difference between January 1990 and 1992?

6. Based on these figures, what is your prediction for January 1994?

PRODUCTION TABLE



(All numbers are in thousands)

	Jan	Feb.	Mar	Apr.	May	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1988	1.1	0.9	1.5	1.05	1.6	1.5	2.2	1.3	1.6	0.9	1.3	1.4
1990	2.2	2.1	2.1	2.0	2.4	2.9	3.1	1.9	3.3	2.7	2.7	1.9
1992	1.9	1.5	1.1	1.1	2.0	1.8	1.9	1.8	1.9	1.6	1.7	1.0

This table is a little more complicated.

- How is it arranged?

- What kinds of information is it comparing?

CHARTS AND GRAPHS IN THE WORKPLACE ♦ SESSION 3

OBJECTIVES:

At the end of this session, students will be able to do the following:

- read and make bar graphs
- understand the differences between graphs and tables
- make projections graphs
- see trends and draw logical conclusions from graphs
- calculate totals, averages, and percentages

TOPICS:

- bar graphs
- pie charts
- drawing conclusions
- seeing trends
- plotting information in different graphs
- calculating totals, averages, and percentages

METHODS:

- Class discussion
- Individual work
- Pair work on some of the graphs

MATERIALS:

- Worksheets
- Rulers
- Graph paper
- Calculators

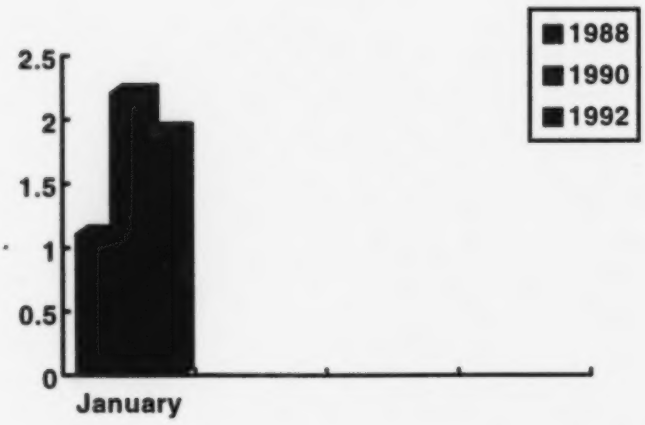
BAR GRAPHS

Here is the **January Production Table** from the last class. It is not too difficult to read, but look at the bar graph below and compare details.

January Production Table
(All numbers are in thousands)

	Jan
1988	1.1
1990	2.2
1992	1.9

January Production
(All numbers are in thousands)



BAR GRAPHS

1. In the bar graph, what does the **horizontal** line stand for?

2. What does the **vertical** line stand for?

3. In the bar graph, what does the first bar stand for?

4. What does the second bar stand for?

5. What does the third bar stand for?

6. How did you figure out what the bars stood for?

7. If you want to know **exact** production numbers, which would you refer to – the table or the graph?

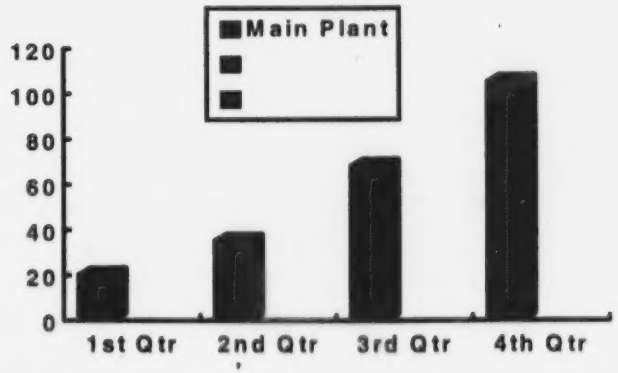
8. If you wanted to emphasize the **comparison** of production numbers, which would you use – the table or the graph?

9. Would the bar graph work if you switched the vertical and horizontal lines? If the vertical line was years and the horizontal line was production? Why or why not?

SEEING TRENDS

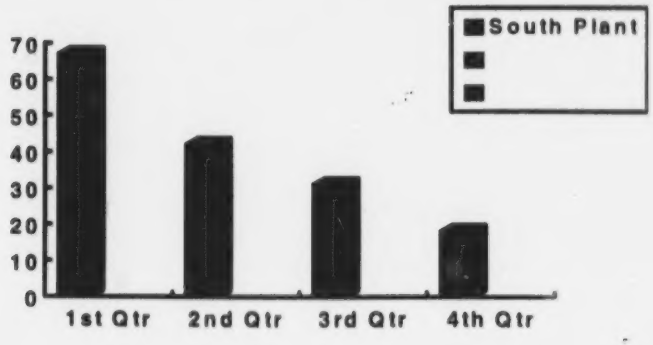
In good and clear bar graphs, when you compare the given information it is easy to see a **pattern** or a **trend**.

What kind of **trend** do you see in this graph?

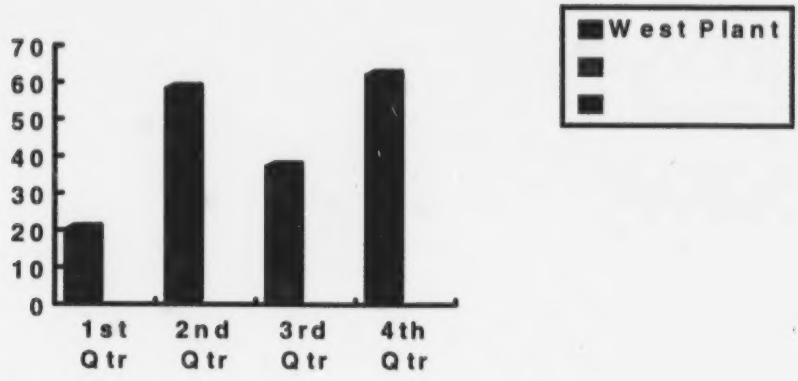


SEEING TRENDS

What kind of **trend** do you see in this graph?



What kind of **trend** do you see in this graph?



TABLES AND BAR GRAPHS

Shipping and Packing Errors

(Numbers shown are in hundreds and are per man hour)

	1	2	3	4
1989	.04	.05	.03	.02

TABLES AND BAR GRAPHS

1. What information is the table giving you to compare?

2. What are the column headings? What do they stand for?

3. What was the error rate for the first quarter of 1989?

4. Second quarter?

5. Third quarter?

6. Fourth quarter?

TABLES AND BAR GRAPHS

7. How many more errors occurred in the second quarter than in the first?

8. What can you conclude about the fourth and third quarters?

9. What **trend** do you see?

10. What **prediction** can you make for the first quarter of 1990?

11. What is the **average** error rate for the whole year? How would you figure that out?

12. Put this information into a bar graph! Use graph paper and determine how you can plot the numbers accurately and consistently.

CHARTS AND GRAPHS IN THE WORKPLACE ♦ SESSION 4

OBJECTIVES:

At the end of this session, students will be able to do the following:

- read and make multiple bar graphs
- understand the differences between the different types of graphs
- take data and make an appropriate graph
- make projections from graphs
- see trends and draw logical conclusions from graphs
- calculate totals, averages, and percentages

TOPICS:

- multiple bar graphs
- drawing conclusions
- seeing trends
- plotting information in different graphs
- calculating totals, averages, and percentages

METHODS:

- Class discussion
- Individual work
- Pair work on some of the graphs

MATERIALS:

- Worksheets
- Rulers
- Graph paper
- Calculators

MULTIPLE BAR GRAPHS

A **multiple bar graph** is a bar graph that has 2 or 3 bars side by side that show the same type of information.

We use multiple bar graphs when we want to compare similar information for different areas or periods of time.

Look at how this table is organized. How can you put it into a **double** bar graph?

Accident Report

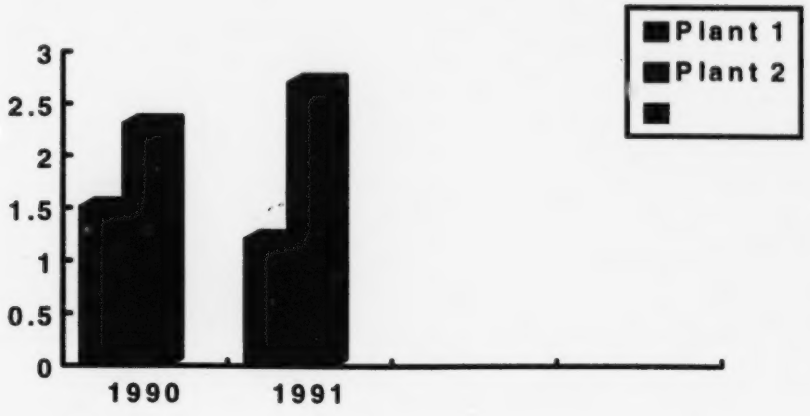
(numbers show the average number of accidents per quarter)

	Plant 1	Plant 2
1990	1.5	2.3
1991	1.2	2.7

MULTIPLE BAR GRAPHS

Your multiple bar graph for that table might look like this:

Graph 1:



MULTIPLE BAR GRAPHS

Or, it could look like this.

Graph 2:

MULTIPLE BAR GRAPHS

What is the difference between the 2 graphs?

Graph 1:

1. What does the vertical line represent?

2. The horizontal line?

3. What do the different shades represent?

4. What is the comparison being made?

5. What **trend** can you see?

MULTIPLE BAR GRAPHS

Graph 2:

1. What does the vertical line represent?

2. The horizontal line?

3. What do the different shades represent?

4. What is the comparison being made?

5. What **trend** can you see?

CHARTS AND GRAPHS IN THE WORKPLACE ♦ SESSION 5

OBJECTIVES:

At the end of this session, students will be able to do the following:

- read and make multiple bar graphs and line graphs
- understand the differences between the different types of graphs
- take data and make an appropriate graph
- make projections from graphs
- see trends and draw logical conclusions from graphs
- calculate totals, averages, and percentages

TOPICS:

- bar graphs
- line graphs
- drawing conclusions
- seeing trends
- plotting information in different types of graphs
- calculating totals, averages, and percentages

METHODS:

- Class discussion
- Individual work
- Pair work on some of the graphs/charts

MATERIALS:

- Worksheets
- Rulers
- Graph paper
- Calculators

MULTIPLE BAR GRAPHS

Here is the accident information for 1992 and 1993.

1. Put the information into a **table**.

2. Make a **multiple bar graph** to show that data. Be sure that your spacing is consistent and that the graph is accurate.

Accident Report

(numbers show the average number of accidents per quarter)

In 1992, Plant 1 had 1.1 accidents per quarter, and then in 1993 that number dropped by .1.

In 1992, Plant 2 had 2.6 accidents per quarter, and then in 1993 that number increased by .2.

BAR GRAPHS – REVIEW

Take a look at the production report table that we discussed in the earlier classes.

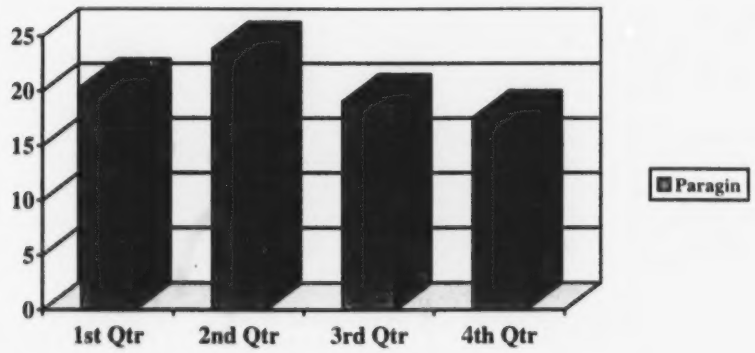
- What kind of bar graph could you make to show the information?

- Break into pairs and make a bar graph to show the information from that report.

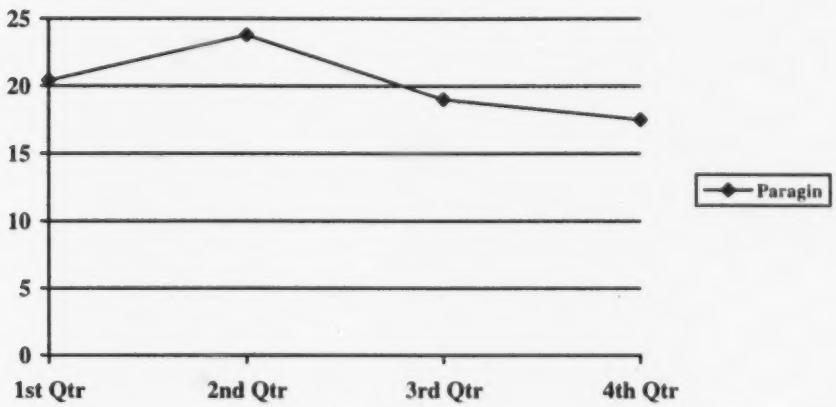
BAR GRAPH VS. LINE GRAPH

Bar Graph

The Use of Paragin in Production
(numbers show pounds and are in hundreds)



Line Graph

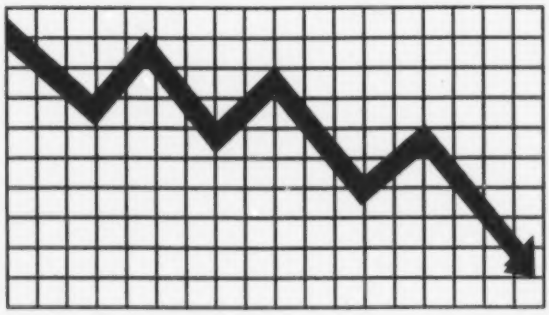


WHY A LINE GRAPH?

We use line graphs to do the following:

- show a change over time
- compare various items and their changes over time
- show trends or movements in a flowing manner

Unlike bar graphs, line graphs *do not* stress the **quantity** but the **trend**.



In a line graph, the **lines** have clear meanings:

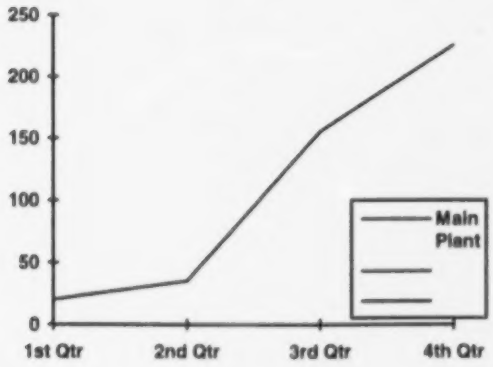
- the **horizontal** line represents time
- the **vertical** line represents the amount or quantity of something (it will be indicated on the graph)
- the line in the body of the table shows the trend and change between the points on the graph

LINE GRAPHS

Some line graphs are easier to read than others. Which of these is the easiest to read? Which is the most difficult? Why?

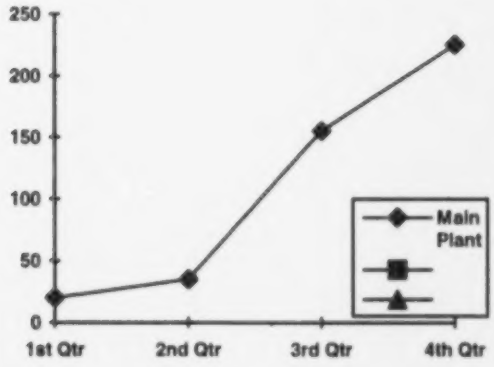
Example 1:

Number of Hours Spent on Training



Example 2:

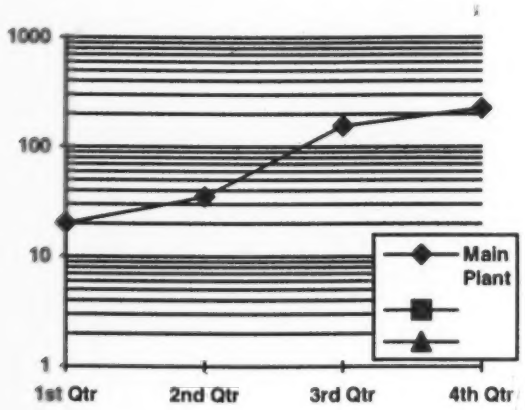
Number of Hours Spent on Training



LINE GRAPHS

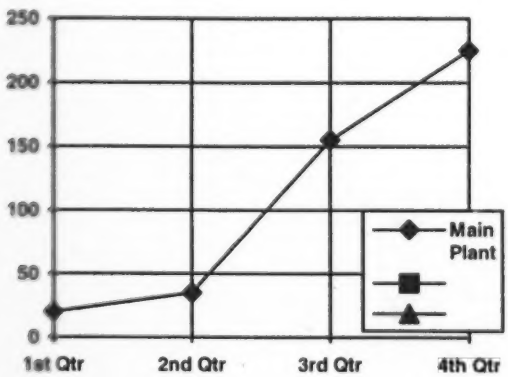
Example 3:

Number of Hours Spent on Training



Example 4:

Number of Hours Spent on Training



CHARTS AND GRAPHS IN THE WORKPLACE ♦ SESSION 6

OBJECTIVES:

At the end of this session, students will be able to do the following:

- read and make line graphs, multiple line graphs
- understand the differences between the different types of graphs
- take data and make an appropriate graph
- make projections from graphs
- see trends and draw logical conclusions from graphs
- calculate totals, averages, and percentages

TOPICS:

- line graphs
- drawing conclusions
- seeing trends
- plotting information in different types of graphs
- calculating totals, averages, and percentages

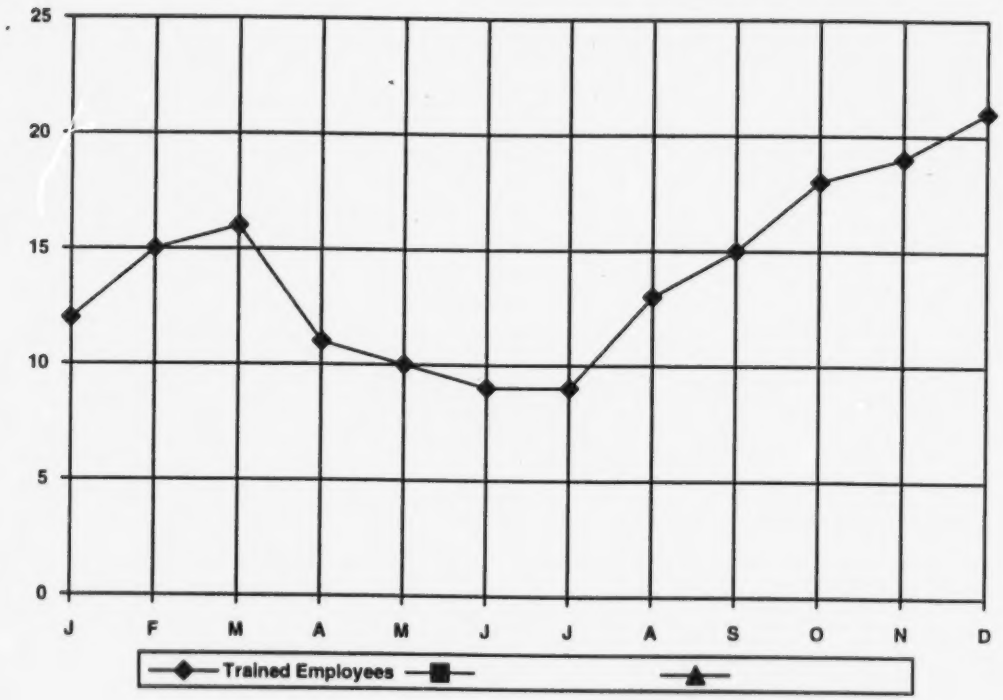
METHODS:

- Class discussion
- Individual work
- Pair work on some of the graphs

MATERIALS:

- Worksheets
- Rulers
- Graph paper
- Calculators

LINE GRAPHS



LINE GRAPHS

1. What does the horizontal line represent in this graph? What are the abbreviations for?

2. What does the vertical line represent? What do the numbers stand for?

3. What would be a good title for this graph?

4. At what point did the first change occur? What kind of trend was it?

5. What happened in April?

6. Were the figures ever the same?

7. When did the greatest change occur?

8. Do you see a stable trend occurring towards the end of the year?

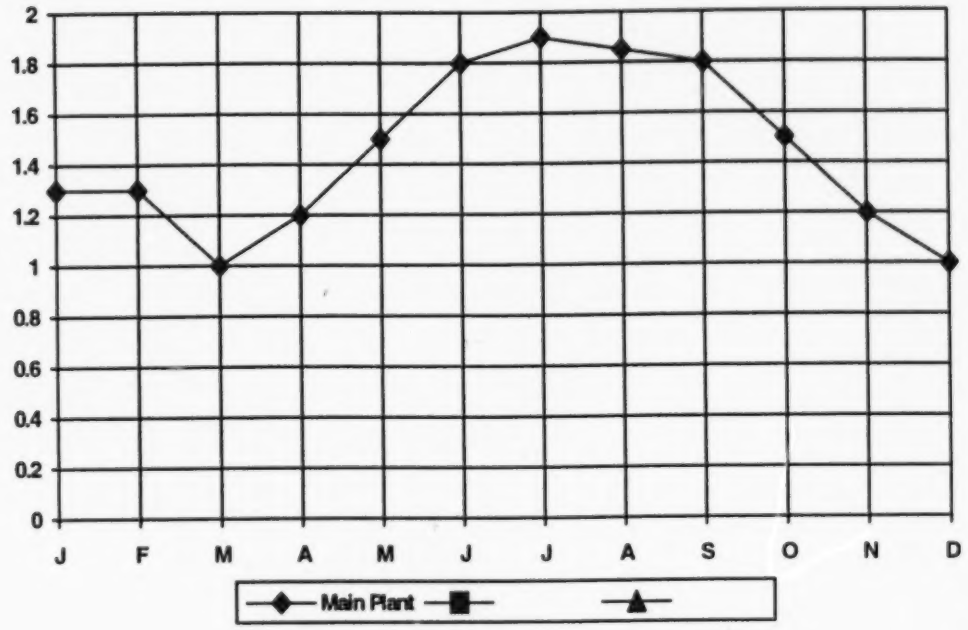
9. What do you think caused the drop between April and July?

10. On what occasion would you use this chart?

LINE GRAPHS

Errors per Month

(Numbers are the average for 3 shifts)



LINE GRAPHS

1. What does the horizontal line represent in this graph? What are the abbreviations for?

2. What does the vertical line represent? What do the numbers stand for?

3. How are the numbers different from those in the earlier graph?

4. At what point did the first change occur? What kind of trend was it?

5. What happened in March?

6. Were the figures ever the same?

7. When did the greatest change occur?

8. Do you see a stable trend occurring towards the end of the year?

9. What do you think caused the drop between July and December?

10. On what occasion would you use this chart?

CHARTS AND GRAPHS IN THE WORKPLACE ♦ SESSION 7

OBJECTIVES:

At the end of this session, students will be able to do the following:

- read and make pie charts
- understand the differences between the different types of charts
- take data and make an appropriate chart
- make projections from charts
- see trends and draw logical conclusions from charts
- calculate totals, averages, and percentages

TOPICS:

- pie charts
- drawing conclusions
- seeing trends
- plotting information in different types of charts
- calculating totals, averages, and percentages

METHODS:

- Class discussion
- Individual work
- Pair work on some of the charts

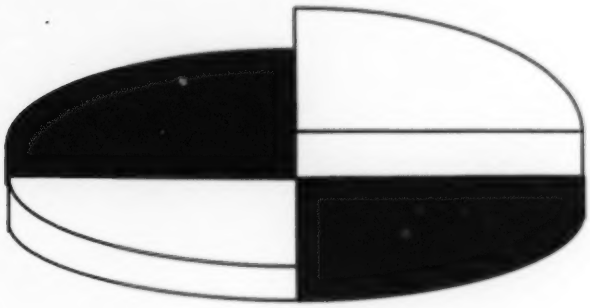
MATERIALS:

- Worksheets
- Rulers
- Graph paper
- Cylinder with which to make a pie chart circle
- Calculators

WHY PIE CHARTS?

Pie charts are different from regular bar graphs and line graphs in many ways:

- the pie represents the **whole** of something
- the numbers shown represent a **percentage** of that whole
- the chart is designed to show the **relationship** of the parts to each other as well as the relationship of the parts to the whole

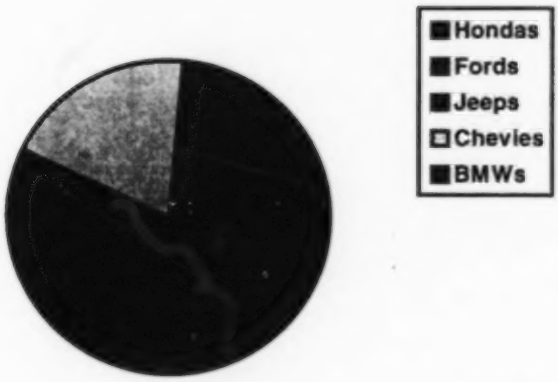


Remember: in a pie chart the percentages must add up to 100% !!

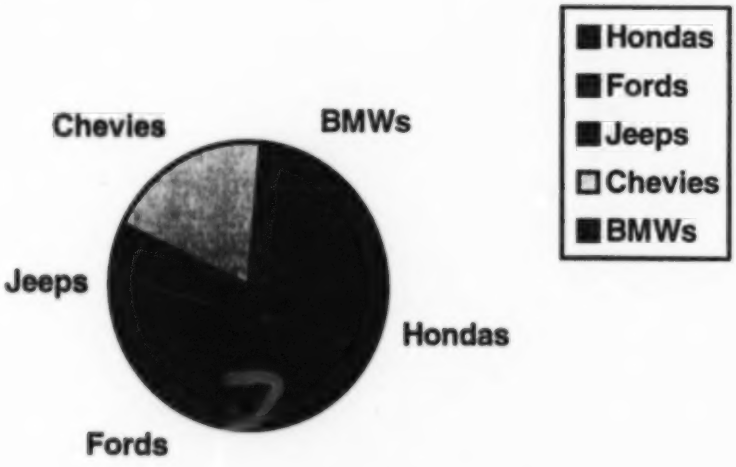
Beware: pie charts have a very specific use and therefore cannot be used interchangeably with bar or line graphs. The key is that a pie chart is showing percentages and a whole of a thing, while other graphs show quantities and trends.

PIE CHARTS

Example 1:

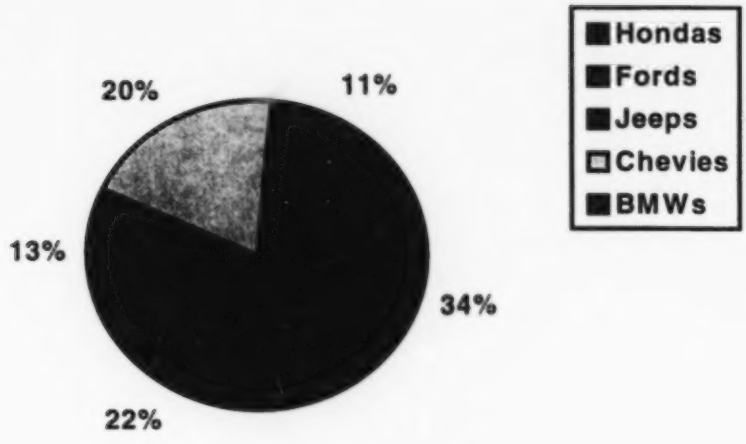


Example 2:

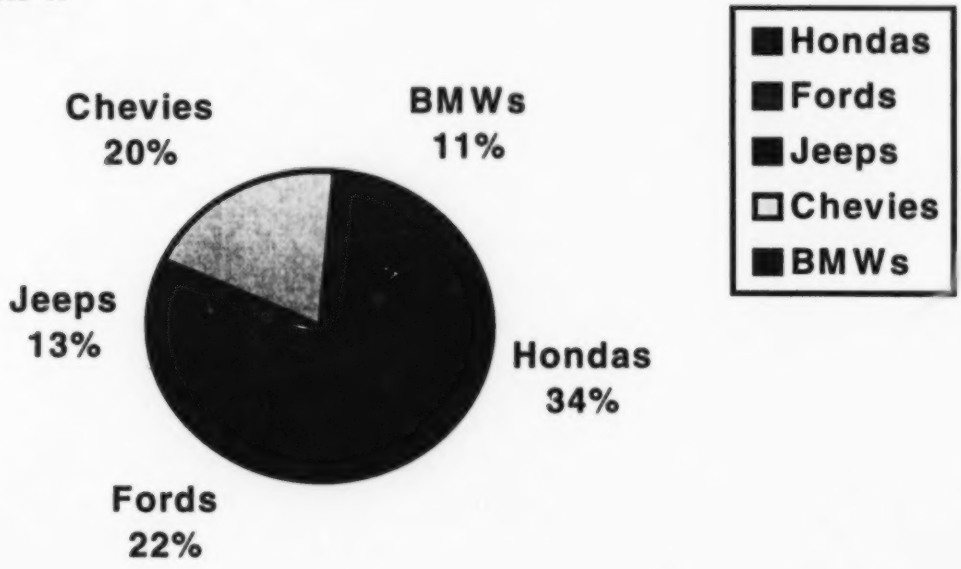


PIE CHARTS

Example 3:



Example 4:



READING PIE CHARTS

1. What does the whole pie represent?

2. What do the pieces represent? How do you know?

3. What is the largest piece? The smallest piece?

4. How are the pieces related to the whole?

5. How are the pieces related to each other?

6. What conclusions can you make from the chart?

7. Would this chart work as a bar graph or line graph? As a table?

PIE CHARTS

Because pie charts use **percentages**, it is important to understand how to arrive at percentages and how to show the correct size of the pie piece.

I: Percentages

Remember that **per*cent*** means "out of 100" – but what do you do if you don't have a 100 exactly? Then you have to calculate the ratio of the individual piece to the total quantity:

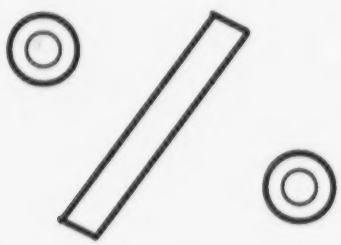
Pride Classes
Male and Female Participants

Male	72
Female	47

Step 1: calculate the total (119)
Step 2: to figure out what percentage of students was male, divide the total by 72

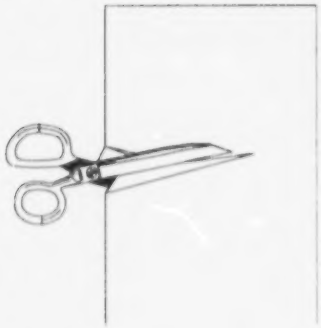
$$\frac{72}{119} \text{ which means } 72 \div 119 = .605042$$

Step 3: round that number to the nearest .00 number (in this case .60)
Step 4: that number means that 60% of the students are male
Step 5: how would you figure out the female percentage?



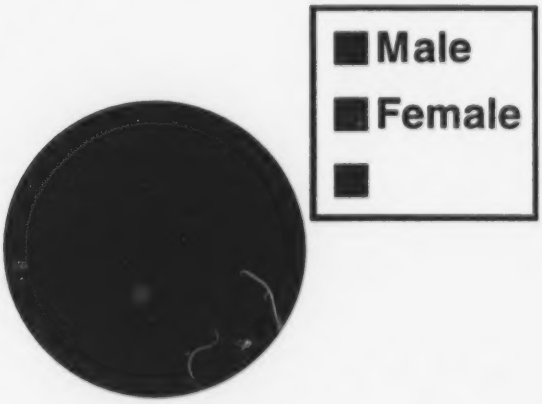
CUTTING THE PIE

II: Pieces and Portions



When you show the pieces of the pie, you have to make them in correct proportion to the whole and in correct proportion to each other.

This is the best representation of our findings (***60% male and 40% female***)?



CHARTS AND GRAPHS IN THE WORKPLACE ♦ SESSION 8

OBJECTIVES:

At the end of this session, students will be able to do the following:

- read a complex table
- make a table from gathered information
- read and make bar graphs, multiple bar graphs, line graphs, multiple line graphs, pie charts
- take data and make an appropriate graph/chart
- calculate totals, averages, and percentages

TOPICS:

- tables
- bar graphs
- line graphs
- pie charts
- drawing conclusions
- plotting information in different types of charts/graphs
- calculating totals, averages, and percentages

METHODS:

- Individual work

MATERIALS:

- Worksheets
- Rulers
- Graph paper
- Cylinder with which to make a pie chart circle
- Calculators

PRE-CLASS EXERCISE

Classes
(The number of students for each class)

⇒ ESL	15
⇒ Math	12
⇒ Writing	11
⇒ Communication	16
⇒ Reading	13

1. How would you show this as a **line graph**?

2. How would you show this as a **bar graph**?

3. How would you show this as a **pie chart**?

POST-CLASS EXERCISE

Classes
(The number of students for each class)

⇒ ESL	15
⇒ Math	12
⇒ Writing	11
⇒ Communication	16
⇒ Reading	13

1. How would you show this as a **line graph**?

2. How would you show this as a **bar graph**?

3. How would you show this as a **pie chart**?